

REMARKS

Introduction

As a preliminary matter, claims 1-9 and 11-12 were cancelled in a Preliminary Amendment filed on December 3, 2004. The sole pending claim is independent claim 10. In response to the Office Action dated March 28, 2007, Applicants have amended claim 10. Support for amended claim 10 is found in, for example, pg. 7, line 19-pg. 8, line 7 and pg. 20, lines 11-22. Care have been taken to avoid the introduction of new matter. In view of the foregoing amendments and the following remarks, Applicants respectfully submit that pending claim 10 is in condition for allowance.

Claim Rejection Under 35 U.S.C. § 112

Claim 10 stands rejected under 35 U.S.C. § 112, second paragraph, as purportedly being indefinite. The Office Action states, “it is unclear whether [the] Applicant is referring to the surface of the board [or] the surface of the conductor wiring, that requires the surface treatment.”

Amended claim 10 recites, “...A method for producing a printed wiring board comprising the steps of: **treating a surface of a board** made of at least one resin selected from among the group consisting of polyimide, polyethylene naphthalate, polyamide-imide, polyethylene terephthalate, wholly aromatic polyamide, liquid crystalline polyester, and fluorine resin for forming a conductor wiring thereon by one of the following surface treatment methods.”

Withdrawal of the foregoing rejection is respectfully requested.

Claim Rejections Under 35 U.S.C. §§ 102/103

Claim 10 stands rejected under 35 U.S.C. § 102 (b) as being anticipated by, or in the alternative, rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 4,487,811 (hereinafter Eichelberger), U.S. Patent No. 4,248,921 (hereinafter Steigerwald), U.S. Patent No. 3,560,257 (hereinafter Schneble), or U.S. Patent No. 4,581,301 to Michealson.

As a preliminary matter, the Examiner noted that the claim is drafted in a product-by-process format. In order to expedite prosecution, claim 10 is amended to, “a method for producing a printed wiring board.”

Amended claim 10 recites, in part, “...a surface of a board made of at least one resin selected from among the group consisting of polyimide, polyethylene naphthalate, polyamide-imide, polyethylene terephthalate, wholly aromatic polyamide, liquid crystalline polyester, and fluorine resin.”

Eichelberger shows a printing wiring board comprised of an insulating substrate 100, a conductive ink 101, and a conductive layer 102. The conductive ink 101 of Eichelberger contains a resin such as a polyimide (col. 5, line 30-col. 6, line 4). The Office Action admits that Eichelberger is *silent* regarding the substrate surface having an average roughness of 30-300 nm. The Office Action states, “since the average roughness is in the nanometer range, the Examiner is taking the position that such surface roughness is insignificantly small, or in other words, it does not have a rough surface, unless [the] Applicant can show some significance of such surface roughness with respect to the integrity of the present claimed product, the Examiner is taking the position that the prior art products would perform the same job.”

Thus, the Office Action is setting forth a motivational rationale not supported by the record, but rather based solely on the Examiner's belief of what one skilled in the art may have tried or recognized.

However, to set forth a rejection including Official Notice, the rejection must include some form of evidence in the record to support an assertion of common knowledge. If Official Notice is taken of a fact, unsupported by documentary evidence, then the basis for such reasoning must be set forth explicitly. The Examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. *See*, MPEP 2144.03(B).

It is well settled that "the Board [and the Examiner] cannot simply reach conclusions based on [their] own understanding or experience - or on [their] assessment of what would be basic knowledge or common sense. Rather the Board [and the Examiner] must point to some concrete evidence in the record in support of these findings." *In re Zurko*, 258 F. 3d 1379, 1386 (Fed. Cir. 2001). *See also*, *In re Lee*, 277 F. 3d 1338, 1344-45 (Fed. Cir. 2002), in which the court required evidence for the determination of unpatentability by clarifying that the principles of "**common knowledge**" and "**common sense**" may only be applied to the analysis of evidence, rather than be a substitute for evidence.

Contrary to these requirements, the outstanding Office Action provides no sound technical and scientific reasoning to support the above recited Official Notice. The relied upon motion must be evidenced in the record, and cannot be based merely on an opinion of the Examiner.

Further, the present application, for example, states on pg. 18, lines 16-23:

In case the conductor wiring is formed from the electrically conductive paste on the surface of the board that has not been subjected to the surface treatment (1) to (4), not only the conductor wiring with fine and clear lines cannot be formed because of the slippery and blurry surface but also peel-

off is likely to occur because the strength of bonding with the conductor wiring that has been formed is weak.

Accordingly, it is respectfully submitted that the claimed surface roughness would not have been obvious because the cited reference does not recognize the unexpected improvement in the strength of the conductor wiring as a result of the surface roughening treatment of the surface of the board, which decreases the width and spacing of the lines found on the conductor wiring *as set forth in claim 10*.

Turning to the prior art, Eichelberger fails to disclose or suggest, at the minimum, "...surface roughening treatment for achieving center line average roughness Ra in a range from 30 to 300 nm," as recited in amended claim 10. Eichelberger is *silent* regarding "plasma treatment," as recited in amended claim 10.

Amended claim 10 recites, "...forming a porous metal layer made of at least one kind of metal selected from among the group consisting of Al, Cr, Co, Ni, Cu and Ag, by sputtering."

Eichelberger discusses forming a conductive layer of metal by augmentation replacement reaction (col. 8, lines 44-46). Eichelberger describes that a layer of contiguous copper 304 is formed over the conductor ink pattern 301 because of the augmentative replacement reaction (col. 10, lines 60-67). Eichelberger is *silent* regarding forming a porous metal layer by sputtering.

According to the claimed subject matter per claim 10, the metal layer is formed from Al, Cr, Co, Ni, Cu, and Ag, by sputtering, and has a porous structure. Thereby as taught in the instant specification, the porous structure has fine metal particles of cylindrical shape, and has an effect of suppressing the electrically conductive paste from spreading (*see, e.g.*, pg. 11, lines 15-18). However, Eichelberger does not disclose or suggest this, and apparently is unaware of the

unexpected improvement in efficiently drying and solidifying the electrically conductive paste while preventing it from spreading.

Thus, Eichelberger fails to disclose or suggest, "...forming a porous metal layer made of at least one kind of metal selected from among the group consisting of Al, Cr, Co, Ni, Cu and Ag, by sputtering," as required by amended claim 10.

The Office Action asserts that Steigerwald discloses a printed circuit board comprised of a non-conductive substrate, a conductive paste, and a metallic layer. Steigerwald discusses applying a curable paste onto the non-conductive substrate (col. 2, lines 9-12). The paste of Steigerwald includes a an organic polymer, which can be a mixture of polyurethane with silicon resins and/or acetal resins (col. 2, lines 61-64). Steigerwald fails to disclose, at a minimum, "...treating a surface of a board made of at least one resin selected from among the group consisting of polyimide, polyethylene naphthalate, polyamide-imide, polyethylene terephthalate, wholly aromatic polyamide, liquid crystalline polyester, and fluorine resin," as required by amended claim 10.

The Office Action admits that Steigerwald is *silent* regarding the substrate surface having an average roughness of 30-300 nm. The Office Action states, "since the average roughness is in the nanometer range, the Examiner is taking the position that such surface roughness is insignificantly small, or in other words, it does not have a rough surface, unless [the] Applicant can show some significance of such surface roughness with respect to the integrity of the present claimed product, the Examiner is taking the position that the prior art products would perform the same job."

As noted previously, the Examiner's Official Notice is traversed. If Official Notice is taken of a fact, unsupported by documentary evidence, then the basis for such reasoning must be

set forth explicitly. The Examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. *See*, MPEP 2144.03(B). Specifically, the Office Action provides no sound technical and scientific reasoning to support the above recited Official Notice.

Turning to the prior art, Steigerwald fails to disclose or suggest, "...surface roughening treatment for achieving center line average roughness Ra in a range from 30 to 300 nm," as recited in amended claim 10. Steigerwald is *silent* regarding "plasma treatment," as recited in amended claim 10.

Steigerwald discusses forming metal layer of silver, copper, or tin (col. 3, lines 31-34). Steigerwald is *silent* on forming a porous metal layer by *sputtering*. According to the claimed subject matter per claim 10, the metal layer is formed from Al, Cr, Co, Ni, Cu, and Ag, by sputtering, and has a porous structure. Thereby as taught in the instant specification, the porous structure has fine metal particles of cylindrical shape, and has an effect of suppressing the electrically conductive paste from spreading (*see, e.g.*, pg. 11, lines 15-18). However, Steigerwald does not disclose or suggest this, and apparently is unaware of the unexpected improvement in efficiently drying and solidifying the electrically conductive paste while preventing it from spreading.

Thus, Steigerwald fails to disclose or suggest, "...forming a porous metal layer made of at least one kind of metal selected from among the group consisting of Al, Cr, Co, Ni, Cu and Ag, by sputtering," as required by amended claim 10.

The Office Action states that Schneble discloses a wiring board comprised of an insulating base 10, a catalytic composition 18, and a metal film 14. The Office Action asserts that the catalytic composition is an organo-metallic compound, which is comprised of a noble

metal and an organic resin (col. 3, lines 15-22; col. 4, lines 20-23). Schneble fails to disclose or suggest, at a minimum, "...treating a surface of a board made of at least one resin selected from among the group consisting of polyimide, polyethylene naphthalate, polyamide-imide, polyethylene terephthalate, wholly aromatic polyamide, liquid crystalline polyester, and fluorine resin."

The Office Action admits that Schneble is *silent* regarding the substrate surface having an average roughness of 30-300 nm. The Office Action states, "since the average roughness is in the nanometer range, the Examiner is taking the position that such surface roughness is insignificantly small, or in other words, it does not have a rough surface, unless [the] Applicant can show some significance of such surface roughness with respect to the integrity of the present claimed product, the Examiner is taking the position that the prior art products would perform the same job."

According to our above remarks, the Examiner's Official Notice is traversed.

Turning to the prior art, Schneble fails to disclose or suggest, "...surface roughening treatment for achieving center line average roughness Ra in a range from 30 to 300 nm," as recited in amended claim 10. Schneble is *silent* regarding "plasma treatment," as recited in amended claim 10.

The Office Action states that the metal film 14 of Schneble is electrolessly deposited over the insulating base via the catalytic bank. Schneble is *silent* on forming a porous metal layer by *sputtering*.

According to the claimed subject matter per claim 10, the metal layer is formed from Al, Cr, Co, Ni, Cu, and Ag, by sputtering, and has a porous structure. Thereby as taught in the instant specification, the porous structure has fine metal particles of cylindrical shape, and has an

effect of suppressing the electrically conductive paste from spreading (*see, e.g.*, pg. 11, lines 15-18). However, Schneble does not disclose or suggest this, and apparently is unaware of the unexpected improvement in efficiently drying and solidifying the electrically conductive paste while preventing it from spreading.

Thus, Schneble fails to disclose or suggest, "...forming a porous metal layer made of at least one kind of metal selected from among the group consisting of Al, Cr, Co, Ni, Cu and Ag, by sputtering," as required by amended claim 10.

The Office Action acknowledges that Schneble is silent about the volume ratio. The Office Action asserts that in view of the prior art teachings, one skilled in the art would easily choose a workable volume ratio for the conductive filler and the binder because find an optimum ratio involves only routine experimentations.

The Examiner is directed to MPEP § 2144.05(II)(B) under the heading "Only Result-Effective Variables Can Be Optimized," which sets forth the applicable standard for determining result-effective variables:

A particular parameter must first ***be recognized*** as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. (citing *In re Antonie*, 195 USPQ 6 (CCPA 1977)) (emphasis added).

In the instant case, the cited prior art is silent regarding the claimed volume ratio of the metal particles M used as an electrically conductive filler and a binder B; so that there is no basis for alleging obviousness thereof based on discovering an optimum value of a result effective variable. Accordingly, it is respectfully submitted that the claimed features would not have been obvious in view of Schneble because the cited prior art does not appear to recognize the claimed

parameters, **in the particular combination set forth in the claims**, as achieving a recognized result.

In rejecting a claim under 35 U.S.C. § 103, the Examiner is required to discharge the initial burden by, *inter alia*, making "**clear and particular**" factual findings as to a **specific understanding** or **specific technological principle** which would have **realistically** impelled one having ordinary skill in the art to modify an applied reference to arrive at the claimed invention based upon facts, -- not generalizations. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); *Ecolochem Inc. v. Southern California Edison, Co.*, 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); *In re Kotzab, supra*; *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999). That burden has not been discharged, as the Examiner has provided no factual basis for modifying the volume ratio of the metal particles M used as an electrically conductive filler and a binder B, as required by claim 10.

The only teaching of the claimed volume ratio of the metal particles M used as an electrically conductive filler and a binder B is found in Applicants' disclosure. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The Examiner's retrospective assessment of the claimed invention and use of unsupported conclusory statements are not legally sufficient to generate a case of *prima facie* obviousness. The motivation for modifying the prior art must come from the prior art and must be based on facts. The Examiner is not free to ignore the judicial requirement for **facts**. To do so is legal error. *In re Lee*, 277 F.3d 1338 (Fed. Cir. 2002). Apparently, the Examiner has relied on improper hindsight reasoning in reaching the conclusion of obviousness.

Schneble does not teach or suggest, , “...forming a conductor wiring by printing an electrically conductive paste containing metal particles M used as an electrically conductive filler and a binder B **in volume ratio of M/B=1/1 to 1.9/1** on the surface of the board for the printed wiring,” as recited in amended claim 10.

The Office Action asserts that Michaelson discloses a printed circuit board comprised of an insulating substrate 5, a seed layer 51, and a conductive layer 52. The Office Action also asserts that the seed layer is comprised of conductive particles uniformly dispersed in a resinous binder. Michaelson discusses using a liquid adhesive, such as an acrylic-, polymer-, or epoxy-based adhesive (col. 9, lines 16-20). Michaelson fails to disclose or suggest, at a minimum, “...treating a surface of a board made of at least one resin selected from among the group consisting of polyimide, polyethylene naphthalate, polyamide-imide, polyethylene terephthalate, wholly aromatic polyamide, liquid crystalline polyester, and fluorine resin,” as required by amended claim 10.

The Office Action admits that Michaelson is *silent* regarding the substrate surface having an average roughness of 30-300 nm. The Office Action states, “since the average roughness is in the nanometer range, the Examiner is taking the position that such surface roughness is insignificantly small, or in other words, it does not have a rough surface, unless [the] Applicant can show some significance of such surface roughness with respect to the integrity of the present claimed product, the Examiner is taking the position that the prior art products would perform the same job.”

As noted previously, it is necessary for the Examiner to include some form of evidence in the record to support an assertion of common knowledge, and cannot be based merely on an

opinion of the Examiner. The above recited Official Notice has not fulfilled these requirements. Accordingly, this rejection is traversed.

Turning to the prior art, Michaelson fails to disclose or suggest, "...surface roughening treatment for achieving center line average roughness Ra in a range from 30 to 300 nm," as recited in amended claim 10. Michaelson is *silent* regarding "plasma treatment," as recited in amended claim 10.

The Office Action asserts that Michaelson discloses a conductive layer 52 that is plated over the seed layer to form a conductive pattern. Michaelson is *silent* on forming a porous metal layer by sputtering.

According to the claimed subject matter per claim 10, the metal layer is formed from Al, Cr, Co, Ni, Cu, and Ag, by sputtering, and has a porous structure. Thereby as taught in the instant specification, the porous structure has fine metal particles of cylindrical shape, and has an effect of suppressing the electrically conductive paste from spreading (*see, e.g.*, pg. 11, lines 15-18). However, Michaelson does not disclose or suggest this, and apparently is unaware of the unexpected improvement in efficiently drying and solidifying the electrically conductive paste while preventing it from spreading.

Thus, Michaelson fails to disclose or suggest, "...forming a porous metal layer made of at least one kind of metal selected from among the group consisting of Al, Cr, Co, Ni, Cu and Ag, by sputtering," as required by amended claim 10.

The Office Action admits that Michaelson is silent about the volume ratio. The Office Action asserts that in view of the prior art teachings, one skilled in the art would easily choose a workable volume ratio for the conductive filler and the binder because find an optimum ratio involves only routine experimentations.

According to our above remarks, it should be noted that the “routine experimentation” basis for an obviousness rejection can only be relied upon by the Examiner if the *prior art* first recognizes the modified parameter as a result-effective variable. In the instant case, the Office Action admitted that the cited prior art is silent as to *any* volume ratio (M/B) of metal particles M used as an electrically conductive filler and a binder B, let alone one the claimed volume ratio of $M/B = 1/1$ to $1.9/1$, as achieving a recognized result (indeed, the Examiner does not reference any portion of the cited prior art for this purpose); so that there is no basis for alleging obviousness thereof based on routine experimentation.

Michaelson does not teach or suggest, “...forming a conductor wiring by printing an electrically conductive paste containing metal particles M used as an electrically conductive filler and a binder B **in volume ratio of $M/B=1/1$ to $1.9/1$** on the surface of the board for the printed wiring,” as recited in amended claim 10.

Conclusion

In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper,

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including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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